Name: **Date:** **Section:**

Na-K Pump Activity: Active Transport in Cells

The Cell's Ion Pump

Phase 1: ENGAGE (2 minutes)

Getting Started:

Open peebedu.com and navigate to Sodium-Potassium Pump Interactive

Look at the cell membrane with its special pump.

The Challenge:

Cells keep sodium (Na^+) and potassium (K^+) at different levels inside vs outside.

Quick Check:

- More Na^+: INSIDE / OUTSIDE the cell
- More K^+: INSIDE / OUTSIDE the cell

Phase 2: EXPLORE (7 minutes)

Run the Pump

Click to operate the pump through its cycle.

What Happens:

1. **Step 1 - Loading:**

- ATP binds to the pump

1. **Step 2 - Shape Change:**

- ATP breaks down (loses energy)
- Pump opens to: INSIDE / OUTSIDE
- Sodium ions: STAY / LEAVE

1. **Step 3 - New Cargo:**

- Pump still facing: INSIDE / OUTSIDE

1. **Step 4 - Return:**

- Pump opens to: INSIDE / OUTSIDE
- Potassium ions: STAY / LEAVE

The Pattern:

Each cycle moves _____ Na^+ out and _____ K^+ in.

Energy Check:

- Without ATP, the pump: WORKS / STOPS

Phase 3: EXPLAIN (4 minutes)

How It Works

1. **Active Transport:**

Unlike diffusion, this pump:

1. **The Energy Source:**

ATP provides energy for:

- Changing pump _____

1. **Why 3:2?**

Moving 3 Na^+ out but only 2 K^+ in creates:

- More _____ charge outside

1. **Cell Functions:**

This gradient powers:

- Nerve impulses
- Muscle contractions
- Nutrient uptake

Phase 4: ELABORATE (1 minute)

Real Examples

Heart Medicine:

Some heart drugs partially block this pump.

Result: Heart muscle contracts more strongly.

Why? _____

Nerve Poison:

Some toxins completely block the pump.

Result: Paralysis

Why? _____

Phase 5: EVALUATE (1 minute)

Check Understanding

1. The pump needs ATP because:

1. Per cycle, the pump creates:

- Higher _____ inside, higher _____ outside

Exit Question:

Why is this pump so important that cells use 30% of their ATP on it?